FP 149

TITLE

CRIMPING PRESS WITH CONTACT FEED

BACKGROUND OF THE INVENTION

The present invention relates to a crimping press for producing a crimped connection by means of an upper tool and a lower tool, in which the upper tool by means of a linear motion crimps onto an end of a conductor a crimp contact which can be laid on the lower tool.

In conventional crimping tools, the parts for advancing the contact, as well as the fixed lower tool and the upper tool arranged above it to move in a guide, are constructed as a unit. Also, the contacts are fed in either horizontal or curved manner, which results in a relatively wide construction. To feed the crimp contacts which are wound on rolls into the press makes elaborate extensions to the cable processing machine necessary. With conventional tool technology, these factors cause the space needed per crimping press with its tool and contact feeder to be large, and the changeover time when the empty contact roll needs to be replaced, or a different type of contact to be processed, to be long.

The Japanese patent specification 07320843 shows a crimping press in which belted crimped contacts are processed. A crimping die and an anvil produce a squeezed connection between a crimp contact and a cable. The belted crimp contacts are fed onto a circular contact guide, the contact belt being moved forward by an advancing finger.

A disadvantage of this known device is that when the crimping tool is changed, or when the contact belt roll is changed, long downtimes result. Furthermore, the space required by crimping presses arranged side by side is large, because of the extensions on the sides of the presses.

SUMMARY OF THE INVENTION

The present invention provides a solution for avoiding the disadvantages of the above-described known device, and creating a crimping press which is narrow, simply constructed, and allows short times for changing tools and contacts.

In the crimping press according to the present invention, the upper tool with crimping die is a unit which can be used directly in the pressing slider. The lower tool with anvil and contact advance, the contact roll, and the contact feeder are contained in a cassette which forms an interchangeable insert. The crimp contacts are fed to the crimping tool in the form of an arc, which causes the crimping press to be narrow. The lateral space requirements for a crimping press are approximately halved, and the changeover time is substantially reduced. On account of the mechanical separation of the upper tool from the lower tool, the contact belt no longer has to be unthreaded. On the crimping press according to the present invention, the crimping height is programmable (variable dead point). This also dispenses with the manual adjustment of the crimping height and crimping tool which is necessary on conventional tools.

Integrated into the receptacle for the upper tool in the pressing slider is a force sensor to monitor the crimping force. On conventional tools, this sensor must be built in either above the coupling between the pressing slide and the tool, or under the baseplate of the tool. This has the consequence that as well as the actual crimping forces, other forces (contact advance, cutting forces for separating the contact from the carrier belt, friction, etc.) are measured along with them. By contrast, in the crimping press concept according to the present invention, only those forces relevant for evaluating the quality of the crimping are measured.

DESCRIPTION OF THE DRAWINGS

The above, as well as other advantages of the present invention, will become readily apparent to those skilled in the art from the following detailed description of a preferred embodiment when considered in the light of the accompanying drawings in which:

Fig. 1 is a perspective view of a crimping press in accordance with the present invention;

Fig. 2 is a perspective view of the crimping press shown in Fig. 1 with the cassette removed and the upper tool removed;

Fig. 3 is a perspective view of the assembled upper tool shown in Fig. 1 from the front;

Fig. 4 is an exploded perspective view of the upper tool shown in Fig. 3;

Fig. 5 is a perspective view of a tool receptacle for the upper tool;

Fig. 6 is a perspective view of the upper tool inserted in the tool receptacle;

Figs. 7 are perspective vies and Fig. 9 is a cross-sectional view showing details of a lower tool; and

Figs. 10, 11 and 12 are perspective views of details of positioning the cassette.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Fig. 1 and Fig. 2 show a crimping press **CR** according to the present invention. Fig. 1 shows the crimping press **CR** assembled and Fig. 2 shows the press CR with a cassette **KA** removed and with an upper tool **OW** removed. A motor **MO** drives a gear **GE**. On an output side of the gear **GE** is an eccentric device that converts the rotational motion of the motor **MO** and the gear **GE** into a linear up-and-down motion that can be transmitted to a pressing slider **11** being guided by a pair of spaced apart vertically extending guides **FU**.

Fig. 3 and Fig. 4 show details of the upper tool **OW**, which encompasses parts subject to wear such as a wire crimper **1**, an insulation crimper **2**, and a cutting punch **3**. Depending on the crimped contact to be processed, further wear parts and distance plates may be necessary. The wire crimper **1** is bolted tightly to a holder **4**, the remaining wear parts inserted, and the upper tool **OW** closed with a front plate **5**. To adjust the height of the insulation crimping, a distancing piece **6** is exchangeable. The cutting punch **3** is supported in the upper tool **OW** in vertically movable manner, its motion being limited by the dimensions of an oval hole **7** formed in the punch.

As shown in Fig. 5, the upper tool **OW** is inserted manually into a tool receptacle **10** arranged at the lower end of the pressing slider **11**, and held against a pin **13** by means of a latch **12**. When changing the tool, the latch **12**, which is pushed upward by a pair of compression springs **12.1**, is pushed downward by means of an extensible piston **14**. For this purpose, the piston **14** must be extended, and the pressing slider **11** must execute a vertical motion in an upward direction.

Via supporting surfaces **15** of the upper tool **OW**, forces arising during crimping are transmitted to a force sensor 16 positioned between the tool receptacle **10** and the slider **11**.

Fig. 6 shows the upper tool **OW** inserted in the tool receptacle **10**. In a crimping operation, the cutting punch **3** actuates the cutter of a lower tool **UW** (Figs. 1 and 2), by means of which cutter a crimp contact **20** is separated from a carrier belt **21**, and the carrier belt **21** fragmented. The forces arising when this is done do not pass through the force sensor **16**, because the cutting punch **3** can move vertically in the upper tool **OW**, and lies directly against a body **22** of the pressing slider **11**.

The cassette **KA**, shown in Fig. 2, is insertable from the rear of the crimping press **CR** and encompasses a contact roll **30** which contains the supply of the belted crimp contacts **20**. A contact belt **KO** passes over a tension pulley **32** and, being twisted through 90°, is guided onto the lower tool **UW**. A paper-tape reel **34** is driven via a toothed pulley by a mating gear located in the crimping press **CR**.

Vertically spring-loaded guide bars **33** are arranged at both sides of the cassette **KA** and serve to insert the cassette **KA** into the crimping press **CR** for cassette changing, the guide bars **33** being guided in guides **33.1** of the crimping press **CR**. On insertion, the cassette **KA** is connected pneumatically and electrically to the crimping press **CR** by means of a quick-change plug connector **36**.

Figs. 7, 8, and 9 show details of the lower tool **UW** comprising a vertical cutter guide **40**, a cutter **41** for separating the crimp contacts **20** from the carrier belt **21** and for fragmenting the carrier belt **21**, an anvil **42** for producing a crimped connection, and a contact surface **43** for guiding the crimp contacts **20**. The fragmented carrier belt **21** falls into a waste pipe **44**.

Advancing of the crimp contacts **20** is performed by a swiveling movement of an advancing finger **45**. This finger **45** engages in transporting holes of the carrier belt **21**, and takes the form of a spring-loaded catch which only pushes the contacts **20** forward when it swivels upward. The two end-positions of the swiveling movement can be set with a pair of setting screws **46.1**, which determine the end-positions of a pneumatic advancing drive **46**. Swiveling and guiding the contact belt **KO** while being advanced is performed by a plurality of guides **47**. These guides **47** are collectively adjustable in the direction of the belt, so that the position of the crimp contact **20** on the lower tool **UW**, and on the anvil **42**, can be determined with precision.

The crimped connection is produced by means of the upper tool **OW** and lower tool **UW**, the upper tool **OW** by means of a linear motion crimping onto an end of a conductor **LE** the crimp contact **20** which can be laid on the lower tool **UW**. This is shown in detail in Fig. 9. The crimp contact **20** attached to the carrier belt **21** has lugs **20.1** for the wire crimp, and lugs **20.2** for the insulating crimp, the lugs **20.1** and **20.2** being plastically deformed by means of the wire crimper **1** and insulation crimper **2** respectively, and after the crimping operation tightly encircling a wire **LD** and surrounding insulation **LI** respectively. The cutter **41** for separating the crimp contact **20** from the carrier strip **21** comprises a slider **41.1** with a cutting edge **41.2**, and a non-moving cutting block **41.3** with spring **41.4**. In the crimping operation, the cutting punch **3** moves the slider **41.1** downward against the spring force of the spring **41.4**, separating the crimp contact **20** by means of the cutting edge **41.2** and a cutting edge **42.1** of the anvil **42**.

Figs. 10, 11, and 12 show details of the exact positioning of the cassette **KA** in the crimping press **CR**. A V-shaped supporting surface **50** of the cassette **KA**, and a V-shaped supporting surface **53.1** of a housing **53**, serve to guide the cassette **KA**, it being possible for the V-shape of the supporting surfaces **50** and **53.1** to have a footing. A nose **51** with a stop **52** serves to position the cassette **KA**, and a positioning mechanism **54** arranged on the housing **53** being provided as an active positioning component. Fig. 10 shows the positioning mechanism **54** in the released state necessary for cassette-changing, and Fig. 11 shows the positioning mechanism **54** in the activated state, in which the cassette **KA** is positioned and tightly gripped. The positioning mechanism **54** consists of a drive, for example a pneumatic cylinder **54.1**, which is connected to a guide **54.2** by means of a pneumatic plunger **54.9**. Arranged in a swiveling manner on the guide **54.2** are a pusher **54.3** and a locking lever **54.4**. The guide **54.2** and the locking lever **54.4** are guided on each side in a vertical groove **53.2** of a side wall **53.3** of the housing **53**. Furthermore, the locking lever **54.4**, which is fastened by means of a swiveling axle **54.7** to the guide **54.2**, is guided at each side in a horizontal groove **53.4** of the housing side wall **53.3**. When the guide **54.2** is lifted, a pressure bolt **54.6** of the locking lever **54.4** is guided in a curve onto the nose **51**. When the guide **54.2** is raised, the pusher **54.3** which is held by an axle **54.7** is also moved upward, at which the pusher **54.3** under the force of a compression spring **54.8** presses

against the stop **52** of the nose **51**. With the movement of the pusher **54.3** and the pressure bolt **54.6**, the cassette **KA** is positioned horizontally and vertically.

In accordance with the provisions of the patent statutes, the present invention has been described in what is considered to represent its preferred embodiment. However, it should be noted that the invention can be practiced otherwise than as specifically illustrated and described without departing from its spirit or scope.